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# RANGE MANAGEMENT

BY

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ALBERTA FOREST SERVICE  
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## RANGE MANAGEMENT COURSE OUTLINE

1. What is Range Management? How does it differ from Pasture Management?
2. Definition of Terms.
3. General livestock management on the range. Stocking rate, season of grazing, kind of livestock.
4. Livestock distribution. Riding, salting, fencing, water development, reseeding, weed removal, fertilizing and burning.
5. Other uses. Water, timber, wildlife and recreation.
6. Range Improvements. Water development, reseeding, fertilizing, weed removal, brush clearing, etc.
7. Poisonous Plants. Larkspur, water hemlock, arrow grass, death camas, loco weed, lupine, etc.
8. Range grasses. Use of Key to range grasses.
9. Range Condition - How to assess it.  
Use of Range Condition Score Card.
10. List of a few publications.

## LABORATORY & FIELD WORK

1. Identification of grasses with the help of Range Herbarium specimens and key to some common range grasses.
2. Range Condition Score Card. How to use it.
3. Film "Food for Thought" and discussion on it.
4. A few slides on Range Management (Not a complete set).
5. Field Trip (Whole afternoon).

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## PART I RANGE MANAGEMENT

"Range Management is the science and the art of procuring maximum sustained use of the forage crop without jeopardy to other resources or uses of the land". - A.W. Sampson. "This is the field of range management, the science and art of obtaining maximum livestock production from range land consistent with conservation of the land resources". - Stoddart and Smith. Therefore, in a broad sense, range management is the art and science of utilizing range forage for (maximum) livestock production on a sustained yield basis, consistent with the conservation of other resources and without endangering other uses of land. Modern forest management has adopted the multiple use policy as a cardinal principle in the daily operations. Multiple uses consist of water, timber, range forage, recreation and wildlife. All these uses have their own place in the general set up. Emphasis should be made on the phrase 'on sustained yield basis'. Forage resource should be used and maintained for perpetuity for continued livestock production. We should not try the method of the man who killed the goose that laid the golden egg. At the same time, conservation of other resources (uses) should not be endangered or jeopardized, while making use of range forage. The main objective of our range management is to promote stability in livestock industry. This is achieved by utilizing the forage on a sustained yield basis, correlating grazing with other uses, and causing no damage to other resources especially to watershed.

There is no rigid priority list for these uses. The only priority that is established for the Forest Reserve area is for watershed. All other uses should take a secondary place. As all uses are inter-related, some priority is given to one or the other according to the special circumstances obtained at that particular locality. For instance in the Kananaskis area recreation has special importance and, therefore, it is given some priority. Sentry-York area in Crowsnest Forest is used for the supply of town drinking water and priority is given for that use. As such in Kananaskis and Sentry-York areas no grazing is allowed. In Clearwater-Rocky Forest the rate of grazing is cut by 50 per cent, so as to accommodate the high wildlife population.

To maintain the forage resource and at the same time to ensure good watershed condition requires the application of good range management. Sustained yield can be obtained only by maintaining the range in good condition. They say that good range management is good watershed management. However, good range management and good watershed management are not identical and may vary in some respects. But since both require stable soil with good infiltration and a healthy ground cover, land which exhibits good range condition will not suffer seriously from watershed damage.

### Range Management Procedure

For good range management, one should have an intimate knowledge of climate, soil, location, livestock and vegetation. The end result will be dependent on how best one can manipulate these factors. One can do little or nothing to manipulate location and climate, but one can avoid unsuitable locations and areas with unkind climate.



## Soil

Soil conditions can be manipulated to a certain extent by the use of fertilizers or by draining very wet areas. Soil conditions can be maintained by preventing deterioration or depletion. Soil is an integral part of the range, and without soil there can be no vegetation at all and consequently no cattle. The importance of soil can be inferred from the fact that it takes 500 to 800 years to produce one inch of soil from the bare parent rock. It is very easy and requires very little time to deplete the soil, but it is very very difficult to bring back depleted soil to its original state.

## Livestock

Livestock can be manipulated with the greatest ease compared to all other factors. Many of the management problems can be tackled successfully by the proper handling of livestock. This can be achieved by changing the kind (cattle, sheep, horse), class (yearling, cow with calf or bull), and number, as well as by obtaining better distribution. All statements made here regarding livestock and vegetation are general and quite broad based. As so many factors are involved every point should be critically assessed according to the particular set of circumstances. When we talk about plant characteristics, the climate, location and soil are to be considered for their modifying effects. So also when we talk of the diet of some animal or palatability of some plants, we should bear in mind the season and the abundance or the scarcity of different plants.

## Sheep

Sheep require the constant care of a shepherd, as they wander a lot and are liable to become easy prey to predators. Major part of sheep's diet consists of forbs. Diet of all animals vary according to the season and the available vegetation. Sheep have a tendency to graze mostly on the top of hills and to bed there. With sheep the bottom lands are quite safe, but we have to be watchful of the bedding grounds and hilltops.

## Cattle

Cattle thrive mainly on grass and consume a little of forbs and browse. Cattle have a tendency to remain in the bottom lands and are reluctant to go up the hill. By moving cattle to the higher land more even cattle distribution and better use of the range can be obtained, but this requires constant riding by the herder. Drift fences are helpful to hold the animals in areas which are not fully used. Cows with calves are the worst in this respect, whereas yearlings wander more widely, and better cattle distribution can be obtained by merely replacing cows with yearlings.

Cattle in this country do not possess sweat glands and, therefore, do not like to stand in the sun for long periods. They graze mainly during the cooler part of the day. During the heat of the day cattle go into the wooded areas for shade. We should also bear in mind that cattle do not go deep into thickly wooded areas for grazing. Woodland grazing is utilized mainly on the fringes by cattle.



Cattle trails to salt grounds and water sources should be watched for erosion. Salt grounds may be shifted periodically and proper trails may be cut and eroded trails may be stabilized.

### Horse

Horses are run within the Forest Reserve and outside in the Green Zone mainly during the winter months. Grasses form the major portion of the diet of the horse. A horse is considered to be equivalent to  $1\frac{1}{2}$  animal units for the purpose of calculating grazing capacity. Horses seem to prefer Timothy grass among other grasses during summer. During the winter months, they seem to maintain themselves on coarse grasses and sedges found in wet meadows.

### Vegetation

Vegetation is one of the factors that can be manipulated, but it is not easy. Firstly, if the soil is depleted, the vegetative cover decreases and poorer species replace the desirable ones. Improvement of range condition (manipulation) may be obtained by completely closing the range for grazing for a period, by the reduction of stocking rate, by delaying (deferring) the grazing season, by the use of herbicides for killing weeds, or by reseeding to better grass.

In most of the allotments we find coniferous and deciduous trees, browse, grasses, and forbs including weeds and poisonous plants. Range vegetation is classified into different range types: Grassland, meadow, browse, conifer, woodland and poplar types are the main types. But the important range vegetation consists of grasses (and grasslike plants), forbs, and browse. Common conifers are spruce, lodgepole pine and fir. Deciduous trees are mainly made up of the different species of poplar. Browse species are willow, birch, alder, buffaloberry, silverberry, saskatoon, rose, and shrubby cinquefoil. Young poplars can be put under this category. Among these, willows, saskatoon, young poplar, and shrubby cinquefoil are very palatable to big game.

Range forage plants are divided into three broad categories according to their usefulness to cattle:

- (a) Desirable plants are those which are quite palatable and are nutritious. These are also called "decreasers" since due to grazing (as they are eaten most) they decrease in number.
- (b) Intermediate plants are called "increasers" and they are of average palatability and they increase in number as the more desirable plants are grazed out.
- (c) Undesirable plants are called "invaders" and these are weeds or trash plants which thrive under overgrazed conditions. Due to the sparse density and poor growth of good forage plants, these undesirable plants (invade) come from outside and if left alone they smother the good plants.



Grasslike plants are usually included with the grasses. (For description of our common grasses please see the Section on grasses). Grasslike plants are sedges and rushes. Sedges are fairly palatable and they have solid triangular stems with no nodes. The leaves are arranged on the stem in 3 series, and they are strongly keeled. Rushes have round solid stems with no nodes. The leaves are spongy and are circular or semi-circular in cross-section.

Most of the grasses in our ranges are perennial, but there are a few annuals too. Generally we should not take into consideration annual grasses for calculating grazing capacities. This is because they are not reliable and may vanish completely during poor years.

Wheatgrasses, fescues, oatgrasses, and bluegrasses are quite good and they are very palatable. Bluegrasses do not yield well. Palatable grasses are grazed continuously and are eaten off first compared to other grasses. Proper management should try to keep these grasses in good number and vigour.

Needle grasses, bromes, and tufted hairgrass are fairly good, but they become coarse or spiny when they mature.

Pine grass and hairy wild rye grass are usually found in the shade of trees in the wooded areas. They are not very palatable and do not cure well on the stem.

Some of the grasses are worth trying for reseeding purposes and they are:

Crested Wheatgrass (specially for very dry areas, likely to do well in areas with good moisture).

Pubescent Wheatgrass (for areas with good moisture).

Reed Canary Grass (for very wet or marshy areas).

Chinook Orchard Grass, Russian Wild Rye, and Creeping Red Fescue

Timothy (for hay or as summer range for horses).

Forbs are herbaceous broad leaved plants (Dicots). Most of the weeds and poisonous plants come under this group. Please see notes under Section on 'Poisonous Plants'. Some of the forbs are palatable like vetches, peavine, and aster, but they do not produce forage in any great quantity.

When we think of range vegetation, our attention is naturally drawn to the grasses in the range. All the perennial grasses store some reserve food in the lower portion of the stem (called the Crown) and in the roots or in the rhizomes. Plants require food as we do, but they are able to manufacture their own food in their leaves with the help of sunlight and carbon dioxide from the air. Leaves act as factories to produce food material, which is to be used for normal vegetative growth of the plant, for reproduction (seed formation) and for storage as reserve food. This reserve food is stored in the crown (lower portion of stem) and in the roots. This reserve food is necessary for our range plants to keep them



alive over droughts and during winter and to form new leaves in the following spring. Therefore, it is most important to protect the desirable plants from destruction and to allow them to grow leafage and store up plant food. When the grass starts to grow in early spring the plant uses the stored food reserve for the initial growth. When the stored food is about exhausted and there is a need for the growth of a new plant body, grazing of the early leafage is very destructive. Heavy grazing at this time weakens or even kills the grass. When the stored food is exhausted, there should be plenty of leaves to produce food for the growth of the grass. Later, the leaves may be removed (grazed) at such a rate as to strike a good balance between the rate of growth along with the storing of reserve food and the rate of removal of leaves. This is the very reason why we discourage over-utilization in the early part of the season or to an earlier entry date.

Damage caused by overgrazing to the vegetation starts with desirable plants losing vigour, and is followed by the number going down. Finally, the range presents a depleted patch of weeds with much bare ground and only a few relic palatable plants. When a range comes to this stage it is very difficult to bring it back to its original condition and composition. Even if grazing is stopped it is very difficult to bring back the original composition, because of the lack of seed of desirable plants. So we should always watch for the number and vigour of palatable plants and see that they do not go down.

### Definitions

Before going into the practical management aspect, we will have some of the technical terms defined.

### Grazing Capacity or Carrying Capacity and Stocking Rate

Usually all these three terms are used as synonyms for one another, but there is some difference in the meaning of the last term "stocking rate". Stocking rate is the practical or working grazing rate which is selected to suit a particular purpose or circumstance and it may be or can be different from the carrying or grazing capacity. For example, in Clearwater-Rocky Forest the stocking rate is half of the grazing capacity because of the consideration for big game.

Grazing or carrying capacity is the number of animals that can be put in (or can graze) in a particular specified area, for a particular season or period. It can be expressed as so many head of cattle to graze for so many months, or as so many acres per animal per month or year, or as so many animal unit months for a particular length of season. Due to climatic variation from year to year, we do find that the stocking rate is at variance with the actual range condition. It is possible to calculate the carrying capacity on the basis of the average or normal year and then set a stocking rate accordingly. But, in order to be on the safe side we should calculate the carrying capacity on the basis of poor year or year of drought and then set a stocking rate. Management quality has a bearing on the stocking rate.

The length of the season is an important factor, as the number of animals. Length of the season should specify the exact period - from which date to which date. Speaking of number of animals, specific mention should be made of the kind (cattle, horse or sheep) and class (cow, bull or yearling) of animals. In an allotment with the grazing capacity of 400 animal unit months for a 4-month (June to September) season, we can put 100 cows for 4 months. If the permittee wants to use this allotment for two months only with 200 cows to make up 400 animal unit months, what would be your reaction? The area is the same, but instead of 100 animals grazing in that same area, he wants to put 200 animals. This increases the rate of harvesting (grazing) and competes severely with the rate of leaf and plant growth. Experiments have shown that increased rate of harvesting is very detrimental to the plants and the total yield of forage is reduced. If the area is small trampling effect will be more pronounced. We have to note which two months he wants to use - the first or the last two months. If he wants to use during the first two months, the effect will be disastrous. If he wants to use during the last two months, we can be lenient to a certain extent in this case, but we should not allow great increase in number for a much shorter period. Generally a little bit of overstocking at the end of the season with a couple of months rest in the beginning of the season can be considered as slightly better than grazing at the normal rate from the beginning of the season.

#### Animal Unit

In order to have a common standard unit covering all kinds of livestock, we take one cow with a calf at foot to be an animal unit.

A horse or a bull	=	$1\frac{1}{2}$ animal units
5 sheep	=	1 animal unit
One yearling	=	$\frac{2}{3}$ animal unit

#### Animal Unit Month

The grazing required for one cow for a month.

#### Proper Use

The limit of grazing that will allow sustained yield (vigour and production). It is sometimes considered the same as palatability. It is a combination of preference and availability.

#### Overuse

By overuse the leaves are removed (grazed) to that extent that food production is badly impaired to cause loss of growth and vigour of plants.



## Overutilization and Overgrazing

Overutilization is overuse of range committed in any single year. When this occurs forage plants are grazed so heavily that, if repeated, severe damage will occur. We may not notice any change in the composition or any loss of vigour. However, if this is allowed to recur then the range becomes depleted and we call this overgrazing. It is the continued overuse for several years. Under this condition most of the desirable plants are killed out. Undesirable and intermediate plants predominate with increasing bare spaces. When this condition occurs, we have to do something to restore the original condition. Even though most of our ranges are not overutilized at the present time, they are invariably overgrazed during the past years. With this legacy we have to be ever watchful of the condition of the range, and not be complacent.

## Condition

This is the state of health of the range, in relation to soil, plant density, composition and vigour.

## Density or Plant Density

It can be expressed as the number of plants per unit area. But here it is the area covered by live vegetation per unit area expressed as a percentage of the total area. While looking directly down upon a square foot of ground if you see  $\frac{1}{4}$  square foot of that ground is obliterated or covered by growing plant material (live vegetation), then we say that particular one square foot of ground has 25% density.

## Composition

It is the relative proportion of the different species in an area. It is expressed as a per cent of the total vegetation or density.

## Vigour

This is the state of health of the individual plant taking into account the size of the plant (leaf and clump), the number of seed heads and seedling production.

## Trend

It is the direction of the change in range condition. It is the comparison between the range condition of two or more years. If the range condition is improving, then it is the upward trend and if it is deteriorating it is in downward trend.

### Deferred Grazing

Withholding of grazing for a specific period (usually one year or season) to promote plant reproduction, establishment of new plants, or restoration of vigour of old plants. Simply it means delayed grazing.

### Rotation Grazing

When a range is divided into smaller units and they are grazed one after another in an orderly sequence, it is called rotation grazing or alternate grazing.

### Primary Range

It is the area which animals prefer to use under very little management. Generally, overuse occurs first here, before secondary range is used.

### Secondary Range

It is the area which is slightly used or unused by livestock under minimal management, and which can be used only by better management and/or by range improvement.

### Grazing Capacity

Grazing capacity can be calculated by estimating the forage yield of the allotment and finding out how many animal unit months we can get out of that area. When the grass is cut green, we should estimate or actually dry the material and find out the dry weight. An ordinary cow needs about 20 lbs. of dry fodder per day or 600 lbs. for a month. Moisture in the green grass varies from 80% in the young lush grass to 40% in mature grass with seed heads. Here is a quick method of finding out the forage yield per acre. Describe a circle with a radius of 21 inches and clip the grass within that circle (9.6 sq. ft.) and weigh it in grams. Then multiple this figure (grms.) by 10 (or add a zero) and that gives the weight of grass in pounds per acre. Several clippings should be taken in areas of uniform vegetation to get a sampling. When we get the yield per acre and the estimated yield for the whole area, take only 40 or 50% of that yield for calculation purposes. This is to leave as carry over on the ground 50 - 60% of the forage. Good management requires this carry over and this will leave about 20% of the seed stalks. When the cattle are taken off the range, we should see some stubble and about 20% of seed stalks still standing. This will help the grass to maintain the vigour and to reproduce well.



Other elaborate methods are used to calculate grazing capacity. During range survey we prepare a range inventory. This includes the listing of range vegetation, range sites, condition classes, trend, range use, estimated stocking rate, physical conditions, and developments. According to Reconnaissance Survey method, the plants are classified, and their proper use factors are noted. While calculations are made, reductions are made in the grazing capacity on account of slope, erosion, unstable soil, lack of water, inaccessibility, downward trend, timber, and rock. These reductions are called utilization cuts.

### Opening Date

The entry date or the opening of the grazing season is very important. This is decided according to the range readiness. Grasses and other plants should have grown enough to allow grazing without detriment to the range. Generally, the entry date is taken as the 1st or 15th of June, but this should be changed to a later date if the growth is delayed by seasonal conditions. This may not be possible to do year after year for practical reasons, and in such a case it is safe to fix a later date June 15 or July 1 as the entry date.

### Range Readiness

Range readiness is the optimum or best time when cattle can be allowed to start grazing. It is the time when range is ready for grazing. This time is mainly based on the stage of growth of forage plants and the condition of the soil. Range is ready when the ground is fairly dry, when the trampling damage will be the minimum. The dangers of trampling damage are like a chain reaction. Young plants and new seedlings may be buried in the wet soil and damaged or killed. Also if the soil is wet the young plants and seedlings may be pulled out completely roots and all from the ground. Trampling in wet ground compacts the soil and causes surface runoff due to poor water penetration. Root penetration also becomes difficult and plants do not establish very well.

Range plants specially the important grasses should have attained the necessary growth and height before they are grazed. Some grasses are tall and others are short and the range manager should know his plants very well. The minimum height required for short grasses has to be different from that required for tall grasses. Any rancher who goes out into the range periodically during early spring can find out whether the ground is soft or dry, and whether the grasses have come up to the minimum height. The reason why we require that grasses should attain a particular height before being grazed is that the plants should be at a stage when they can stand on their own and not depend on the reserve food. Plants should be in such a stage that the removal of the leaves by grazing and the production of food for the plants by the remaining portion of leaves are well in balance.

Range readiness is best determined by the soil condition and the growth of grass. However, there are some indicator plants by which we can determine the time of range readiness. These plants vary from place to place and so it is better to rely on the actual observation of soil and grasses. Nobody will go to look at a photograph of a person to know how he looks, when the person himself is at hand to look at.

Anyway to satisfy the academic interest on plant indicators of range readiness a list is given below, which is prepared by U.S.D.A. Forest Service for Region 1 (Montana). This list may hold good for Montana region, but not in other regions.

### Montana List of Indicators of Range Readiness

#### Grasses

- |   |                                |
|---|--------------------------------|
| 1. Rough fescue ( <i>Festuca scabrella</i> )          | 8" - 10"                       |
| 2. Bluebunch wheatgrass ( <i>Agropyron spicatum</i> ) | 6"                             |
| 3. Idaho fescue ( <i>Festuca idahoensis</i> )         | Heads beginning to show        |
| 4. Bluegrass ( <i>Poa</i> spp.)                       | Fully headed to in bloom stage |

#### Forbs

- |  |                               |
|--|-------------------------------|
| 1. Balsamroot ( <i>Balsamorhiza</i> )                    | First flowers in full bloom   |
| 2. Groundsel or Ragwort ( <i>Senecio</i> )               | In full bloom                 |
| 3. Dandelion ( <i>Taraxacum</i> )                        | In full bloom                 |
| 4. Low Larkspur ( <i>Delphinium bicolor</i> )            | In full bloom                 |
| 5. Shooting Star ( <i>Dodecatheon</i> )                  | Should have flowered and gone |
| 6. Pasque flower or Prairie Crocus<br>( <i>Anemone</i> ) | Should have flowered and gone |
| 7. Buttercup ( <i>Ranunculus</i> )                       | Should have flowered and gone |
| 8. Blue-eyed grass ( <i>Sisyrinchium</i> )               | Should have flowered and gone |
| 9. Spring beauty ( <i>Claytonia</i> )                    | Should have flowered and gone |

#### Shrubs

- |   |  |
|---|--|
| 1. Saskatoon ( <i>Amelanchier alnifolia</i> ) | Starting to bloom                      |
| 2. Chokecherry ( <i>Prunus virginiana</i> )   | In $\frac{1}{2}$ to $\frac{2}{3}$ leaf |
| 3. Willow ( <i>Salix</i> )                    | In $\frac{1}{2}$ to $\frac{2}{3}$ leaf |
| 4. Currant ( <i>Ribes</i> )                   | In full bloom                          |



## Distribution (or handling) of Cattle (livestock)

This is the essence of range management and forms the main basis for range improvement. Range utilization should be evenly spread out through the allotment, in order to avoid overutilization of certain areas and under or non-utilization of other areas in the same allotment. Breeding cows and cows with unweaned calves tend to stay on the bottom land so much as to overutilize valley bottoms and leave almost untouched the uplands and hill-tops. On the other hand, sheep as a group tend to stay longer on the hill-tops and bed on the crests, leaving the valley bottom fairly underutilized. These animals by their very nature and instinct have different tendencies. In order to achieve better distribution of livestock on the range, we have to adopt various methods (either singly or in combination) by which livestock can be made to utilize the forage uniformly. Most of the methods we adopt for obtaining better distribution can easily be called range improvements.

## Stock Water

Generally a cow or a horse needs about 10 gallons of water daily, and a sheep or goat requires about a gallon of water. Cattle prefer to drink water daily during the summer months and once in two days during winter, or spring when the forage is high in moisture content. Horses prefer to drink water daily throughout the year. This is due to the fact that they have to travel more than cattle to find sufficient forage and also because of the large quantity of mature dry grass eaten during winter. Sheep can go without water for several days depending on the availability of succulent forbs and moisture in the atmosphere.

The objectives of providing water are to supply the physiological need, to provide more even distribution of livestock and to make use of areas which are not used because of lack of water. Water should be provided in convenient locations and they should not be far apart. Cattle should not be made to travel farther than  $\frac{1}{2}$  mile in rough mountain country, and 2 miles in flat ranges free from rock. Sheep and goats can travel farther, 1 - 2 miles on mountainous range and 4 - 5 miles on flat range.

If water development projects are to be undertaken, it is a good idea to consult the P.F.R.A. men in regard to technical and financial aid. A simple method of providing clean water in places where we have a small seepage or a very feeble spring, is to dig a pit 2' x 2' and 3' deep on the side of the hill. This pit is to be lined with rubble and boulders on the sides and bottom. Then a pipe can be drawn from the pit at a depth of 2' leaving one foot space for silting. This pit should be fenced and care should be taken that it is in working condition at all times by periodical removal of the silt and keeping the stones in position. Water from this pit can be drawn to a suitable spot where a wooden trough can be installed.

## Salt

Sufficient quantity of salt should be provided at proper locations. The quantity may vary from 1 lb. to 2½ lbs. per cow per month. Flat grounds on accessible ridges, knolls, benches, shady places in scrub timber, smooth

or flat rock outcrop, and in places of low palatability, where animals seldom go are some of the good locations suitable for placing salt licks. Salt is supplied as a mineral nutrient as well as for obtaining better distribution of cattle. Some of the spots that we should avoid are places near water, trail or fence, steep slopes, creek bottoms, meadows or grassland and near poisonous plant patches.

Salting should be done before the cattle are let in. Salt should be removed for a while before the cattle are moved to a new area. This will make them salt hungry and facilitate easy settling down in the new area.

Salting should be done in such a way that the animals are not made to walk long distances to get salt. One salting place for every 50 or 60 head of cattle would be satisfactory and they need not be more than one mile apart.

Generally, we change the salt ground once in 3 or 4 years, depending on the condition of the ground surrounding the salt licks. In many allotments it may be necessary to shift the salting grounds even during the same season. This is to attract the cattle to those areas which are to be used at the particular time of the season.

### Fencing

Short drift fences do help in keeping the animals in places where we want them to be. Suitable locations should be chosen so that the separated areas will be convenient for management. Fencing may also be necessary if we are to follow some rotation system of grazing. Fencing can be used to enclose patches of poisonous plants.

### Trails

Trails or cattle driveways are necessary when we come across down timber or deep dense timbered area, so that cattle can have easy access to some secluded pasture area. Trails may help animals to use areas more fully, than they would otherwise use without the trails. By cutting a well defined trail we can avoid numerous trails created indiscriminately by cattle which may cause erosion problems.

### Riding

Riding is necessary for better distribution of cattle for uniform utilization of the range and for protecting the cattle from predators, poison plants, and rustlers. It is suggested to have a full time rider for every 500 head of cattle. In rugged terrain riding requirements will be more. If a full time rider is not possible, the permittee or lessee himself should do the riding. A workable schedule should be worked out with the permittee and we should see that it is carried out.



The key to success in range management is "distribution of cattle". When cattle are well distributed in the range and are moved from areas about to be overused to underused areas, we obtain good and uniform utilization of the range. This leads to good range management. All the items described above are meant to facilitate better distribution of cattle.

### Fish and Wildlife

At times we come across large numbers of game animals in the range allotments. This may create some problems. Almost all the big game derive their forage mainly from the browse plants. Elk is an exception to this general rule. The diet of elk consists mainly of grass, similar to cattle.

The diet varies according to the season or time of the year. Generally, the diet of elk contains from 56.58% to 85.00% of grass. Mule deer take browse and forbs and the proportion varies from 50:50 to 90:10. The policy in the Forest Reserve appears to limit big game population to the available winter forage. We should cooperate with the Fish and Wildlife Division in this respect. If the number of elk is getting out of hand, we may then request for larger harvests.

Among our range improvement projects brush clearing is one which we may try in some selected places. In such cases we should consult the Fish and Wildlife Division, as to population density of big game and its implication. When brush is removed from one area, there must be some alternate feeding grounds for the game animals. Fish habitats and game bird habitats should not be disturbed or polluted.

### Range Condition

All our efforts are intended to maintain the range in good condition. We should know what a good range is and how to assess a range for its condition.

A good range should have good soil or soil in good condition, with no erosion or compaction. It should have good vegetation cover or plant density. No bare ground or space should be seen. It should have palatable and perennial grasses in good number. It may contain very few weeds and undesirable plants. In other words it should have a good composition. It should contain palatable (grasses) in robust growth, having big clumps, tall plants, many vigorous seed heads and a number of grass seedlings. The above conditions - good soil, high density, good composition, and robust vigour - denote a good range. In order to judge fairly accurately the range condition, we use the Range Condition Score Card. These four factors are assessed separately and the total points are added up to be compared with the ratings on the Score Card, and to be assigned to its particular class. If the range condition falls under "good" class it shows that the range is well managed and we can maintain

the range condition at this level, if we continue grazing at the same rate. If it is in "fair" class, we need not worry so much, but should be watchful for the trend in subsequent years. By simple methods like deferring the opening date or reducing the stocking rate, the range condition can be improved. If the condition class is either poor or very poor, we have to take active steps to rectify the causes which brought about this condition. Here we should think about the different methods of range improvement and apply some of them which are most suitable and feasible for that particular situation.

In order to know the condition of the range year after year and to find out what the trend is, we keep a permanent record of the condition of the range. To be consistent throughout the period, we establish what are called permanent transects. Observations are taken year after year on the same transects and preferably on the same date. These transects are usually in a cluster of four with a length of 25 ft. each. Four transects (one cluster) are laid within an exclosure and four in the open grazed area. These exclosures can be used as demonstration plots to show to the ranchers what elimination of grazing can do to the range. Photographic records are kept of the transects inside and outside the exclosure.

#### Permittee or the Rancher

We should always have the cooperation of the permittee. This can be obtained by being in constant touch with him, informing him of the condition of the range and of his livestock, and giving suggestions. We should show our real interest in his livestock and try to know how they are during the period they are off the Crown land. We should be interested in his calf crop and beef gain. In many areas range improvements are possible and we should try to get those permittees interested in these projects. It would be better if they are asked to take the initiative. The Department will certainly encourage and give whatever help they can. Since the grazing dues they pay are very nominal, they should be able to bear some cost for their own benefit.

We should always make it a point to explain fully why we are doing or asking them to do certain things. Most of the ranchers are amenable to reason and if they understand our reasons behind our action, there will be very little opposition.

#### Summary

Range Management is an art and science of managing the forage resource to the best of our ability. There is quite a bit of art involved in this. There is very little of rule-of-thumb in this business of range management. Every situation is to be critically considered using plenty of common sense, taking into account the location, climate, kind and class of livestock, big game and fish population and habitats, and other competing vegetation. Further, the interaction between these factors and the subsequent effect when one or more factors are altered, should be carefully considered. It is a good policy to try improvement methods on a small scale before launching on a large scale project.



## PART II    RANGE IMPROVEMENTS

### 1.    Toxic Plant Control

- (a) by mechanical means
- (b) by chemical means
- (c) by biological means

Weeds may contain poisonous plants (Larkspur, Death Camas, Water hemlock, etc.), mechanically injurious plants (cactus, plants with burrs, etc.) undesirable forbs and grasses (Canada thistle, cheat grass) and undesirable woody plants (Alberta rose, Alder, Swamp birch).

#### Why we do it?

1. To increase forage production in quantity.
2. To increase forage production in quality.
3. To increase livestock production or quality.
4. To reduce livestock loss.
5. To help natural reseeding.
6. To augment the results of reseeding.
7. To help handling of livestock.
8. To reduce fire hazard.
9. To increase water yield and its quality.
  - Grass uses the least quantity of soil moisture (10".0)
  - Conifer uses more quantity of soil moisture (14".5)
  - Poplar uses the most quantity of soil moisture (19".0)
10. To limit the habitat for insects and diseases.
11. To reduce the cost of labour and equipment (Highways Dept.).

#### (a) Mechanical Means

Bulldozer, gyromower, rototiller and similar equipment can be used. We should see that this operation does not create erosion problems.

#### (b) Chemical Means

Choose the proper chemical, use the right strength and rate, do it when the phenological stage of the plant is right, and do it on a suitable day and time. With systemic herbicides it is best to do when translocation is maximum. Avoid streams, creeks and rivers. Keep away from susceptible crops. Keep the animals off the treated areas for some time, as the plants become more palatable due to the chemical spray.

Consult "Report of the Research Appraisal Committee for Western Canada - National Weed Committee Western Section". or

Contact Supervisor Soils and Weed Control, Department of Agriculture, Edmonton. or

Contact the local District Agriculturist for specific treatment of individual weed.

## (c) Biological Means

Instead of using chemical or mechanical agents, here we use living agents (diseases and insects) for controlling weeds. In other countries they have successfully used insects to control Prickly pear and Lantana. In North America Chrysolina beetle has been used to check St. Johnswort (Hypericum perforatum). This is a bad weed causing photosensitivity in cattle specially and is found in British Columbia.

### 4. Reseeding

Why? Natural seeding to good species takes a long time. For natural seeding there should be enough plants to supply the seed. Poor soil, drought and rodents make natural seeding useless. By natural seeding we do not cause soil disturbance.

Careful consideration should be given to decide whether to do artificial reseeding or not. Artificial reseeding is expected to result in more forage, in better quality forage, in elimination of cattle loss by poison weeds, in stabilizing the soil and in conserving water.

Where? Where the range type is suitable like grassland, meadows, browse and even in open poplar types. Where the rainfall is right. A minimum of 12" of precipitation would ensure a good stand and the precipitation should be well spread out within the year. The soil suitable for reseeding should have good moisture holding capacity. Sandy and clay soils are not good. The area should be fairly level. We do not encourage reseeding on steep slopes for forage purposes. To get the best result there should be very little competition from other plants, especially the weeds. It is good to remove trash vegetation before reseeding.

When? Seed should have 50 - 60 days of favourable period. Reseeding may be done 50 - 60 days before the peak rainfall period.

Here in Canada we have two sowing periods - early spring and late fall. Local conditions should dictate the exact time to reseed.

What? Some of the wheatgrasses, Fescues, Orchardgrass, Russian Wild Rye, and Reed Canary grass may be tried. Crested wheatgrass is specially suited for drier areas, but it does well in areas with good soil moisture. Reed Canary grass should do well in very moist areas.

How? Seedbed should be prepared adequately. Sowing can be done by broadcasting or by drilling. In rough terrain broadcasting is the only method. In any case, seeds should be covered after sowing by floating or brush harrowing.

Points to remember: Select the best site. Remove undesirable plants. Prepare a firm seedbed. If possible, drill using plenty of seed and shallow planting depth. Protect reseeded area and manage it carefully. If possible do not graze reseeded area for two years, if not start grazing it very slightly during the latter half of the season in the second year.



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### 3. Range Fertilization

Mountain meadows, grassland and reseeded areas are suitable for fertilization. Rainfall or precipitation should be ample, and areas with less than 10" - 15" are not suitable.

Some of the benefits are: increased forage production in quantity and quality, early spring growth, increased palatability, change in composition, increased vigour and helps in cattle distribution.

Nitrogen fertilizers alone are quite good for our ranges. Experiments have shown that animals gain in body weight very greatly in fertilized ranges.

A note of caution should be taken into account. In a badly abused range overrun with all sorts of weeds, fertilization would only help the weeds to become robust and to take over completely. In such cases, defer fertilization till you have removed the offending weeds.

Fertilizer may be tried to change the composition in marshy areas.

### 4. Brush Clearing

Silver berry, Alberta rose, Shrubby cinquefoil, Swamp birch and Willows are some of the brush that are found in our ranges. In some areas they could be removed to provide better and more forage for livestock.

Methods suggested for weed eradication may be tried.

Brush forms the main feed for all the big game except elk. Due consideration should be given while contemplating removal of brush. Methods of removal should not create erosion problems. If chemical sprays are used we should strictly avoid stream pollution.

### 5. Use of Fire

Great caution should be practised while using fire. Fire may be used to clean up old duff or rough (debris of old dead grass). This will facilitate early spring growth and better growth with no impediment.

Fire may be used to kill all coarse sedges and grasses in marshy areas. Fresh tender growth may be palatable and if the areas are accessible (not too wet) good utilization can be expected.

### 6. Stock Water Development

Cattle should have adequate (in number and quantity) water supply in the range. Access to water should be well developed. Existing water supplies should be kept in good condition. Springs, seeps, dugouts, dams and troughs could be developed in places where water is scarce or lost. Financial and technical aid can be obtained from P.F.R.A. Recently, they have agreed to aid in the installation of wooden troughs.

## 7. Trail Cutting

Range forage should be easily available to cattle. Trail cutting may be quite useful in removing down timber and in opening passage through thick timber stand. Trails may be needed to lead to stock water or to grasslands which are not easily accessible or which are not fully utilized.

## 8. Fence Construction

Fences are useful to demarcate the allotment boundaries and for dividing allotments into distribution units. Fences are required to protect water sources in stock water and development projects. Fences may be put around patches of poisonous plants. Short drift fences are quite handy to hold cattle in places where we want them to be.

Along with fences we have to use cattle guards or what are called Texas gates. Even on highways Texas gates are used, which are made of rails with flat side up. In places where Texas gates are not wanted on highways, white lines are painted on the black top and this has the same effect on cattle.

## 9. Range Rodents Control

Pocket gophers and ground squirrels may be the worst enemies in our ranges. Rabbits, porcupines, rats, mice, chipmunks and marmots are not good for the range. These animals damage the forage by eating and by covering with dirt, and also by eating the grass seeds. Natural seeding is hampered by the loss of seeds. It is recorded that by controlling gophers the forage yield was increased six times that of the original yield from the untreated range.

Many kinds of poisons are used to kill these rodents. In order to attain a high percentage of success, we should allow a period of pre-baiting, using the same grain but without the poison. Time of operation is also very important. Control measures should be undertaken when these rodents are likely to eat the bait and not the grass.

## 10. Water Spreading and Erosion Control

This may come under the purview of watershed management or soil conservation. Where there is a tendency for the water to go down enmasse on a slope and to cause erosion and gully formation, water spreading may be attempted. By breaking the flow of water and spreading it over a wider area by means of dikes and contour furrows we may reduce soil erosion and at the same time get the benefit of water spreading over a larger area of range land. Mr. Hanson (of Eastern Rockies Forest Conservation Board) has mentioned one instance where they are doing this.

Depleted slopes may be reseeded, or fertilized to reduce erosion. Gullies may be plugged with logs and boulders which are handy.

All these improvements aim at improved production (quantity and quality) or forage and improved utilization to result in increased livestock production.



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### PART III    SOME POISONOUS PLANTS OF THE RANGE

1. Larkspur - Delphinium bicolor (Low larkspur) and D. scopulorum or Delphinium glaucum (Tall larkspur)

Low larkspur is a small plant and rarely attains a height of two feet. After a rapid growth in May-June, the plant ends its life cycle in mid-July. Tall larkspur grows to five feet or more. All parts of the plant are poisonous throughout the life of the plant. Sheep and horses are not affected by this. Consumption of the plant material equivalent to 0.1% or more of the body weight of the animal is fatal.

The plant appears similar to geranium, but can be identified by its hollow stem and alternate leaves. The flowers of the genus Delphinium have the upper sepals prolonged into a slender tubular spur, hence the name larkspur. Petioles of larkspur leaves do not have stipules.

Poison:        A toxic alkaloid.

Symptoms:    Staggering, falling down, bloat and convulsions.

Treatment:   Prompt attention may save some animals, if they are given a subcutaneous injection of Larkspur tablet (consisting of Physostigmin salisylate 1 grain and pilocarpin hydrochloride 2 grains and strychnine sulphate  $\frac{1}{2}$  grain) dissolved in water.

In many cases we have to live with larkspur in the allotments. If there is heavy infestation of larkspur in concentrated areas, these areas may be fenced off. In some cases grubbing the area to root out this plant may be possible. Nowadays with the recent advancement in the use of herbicides, there are possibilities of eradicating this plant with Tordon and mixtures of Tordon and 2,4-D. It is a common practice to avoid larkspur in early spring by not allowing cattle on the range during the early part of the grazing season.

Hungry, underfed cattle, and cattle trailed over a long distance have a tendency to devour anything and everything that is handy and green. It is suggested that cattle are fed properly with mineral and protein supplements (especially phosphorus) during the winter months. Cattle coming over long distances may be given supplemental feed for a few days, when they reach the range allotment. Avoiding the poison patches for the first few weeks may keep down the losses.

2. Death Camas - Zygadenus gramineus

The plant looks like a common lily, with an onion-like bulb deep in the soil. It is poisonous mostly to sheep, but cattle and horses are affected to a small extent. This plant is easily mistaken for smooth camas (Zygadenus elegans) and bronze bells (Stenanthium occidentale) which are not poisonous. This poisonous plant can be identified by the fact that all the flowers are closely clustered to the tip of the

inflorescence. Fortunately, this plant is mainly found in the Prairie region and not much in the forest areas.

Poison: It is an alkaloid called *Lygadenin*.  
 Symptoms: Salivation, difficulty in breathing, vomiting, staggering and coma.  
 Treatment: Poisoned animals should be kept quiet and provided with good feed and water. If available, Death Camas tablets may be given.

As this plant occurs in overgrazed areas, sheep may be kept out of infested area until July when the grass would have attained good growth.

### 3. Arrow Grass - *Triglochin maritima*

This is not a grass but looks like one with spongy roundish leaves. The inflorescence looks like a typical spike. The plant grows near marshy areas and saline flats. All parts of the plant are dangerous at all times. It is poisonous to cattle and sheep. When the ground is frozen or when a wet meadow dries up, animals have easy access to this plant and losses may be heavy. It is not very common in the forest areas.

Poison: Hydrocyanic acid.  
 Symptoms: Muscular spasms, chomping of the jaws, and hard breathing.  
 Treatment: The poison is an extremely rapid one. There is no sure treatment. Corn syrup drenches can be tried. Intraperitoneal injection of 2 grams of sodium thiosulphate and 1 gram of sodium nitrate in a 20% water solution is recommended.

Heavy salting, careful herding and fencing worst areas would prevent cattle losses. The plant contains a high percentage of salt, making the plant quite palatable, hence heavy salting is recommended.

### 4. Water Hemlock - *Cicuta maculata*

It is also known as poison hemlock. This belongs to the family Umbelliferae and bears white flowers in compound umbels. The leaves are tripinnately compound and the plants are found near wet marshes and springs. It is poisonous to all livestock, but sheep are not affected as they avoid wet areas. All the plant parts are poisonous. During early spring young leaves and stems are virulently poisonous, but later they become less poisonous. The tuberous root stock is always deadly poisonous and when cut open it shows distinct partitions.

Water parsnip (*Sium cicutaefolium*) is a non-poisonous plant and resembles, very much, poison hemlock. Water parsnip has simple pinnate leaves and numerous bracts at the base of the umbels. Rootstocks are not chambered.

Poison: Cicutoxin and it is a resinoid.  
Symptoms: Violent convulsions, frothing at the mouth, chomping of the jaws, extends the legs rigidly, throws back the head and bellows loudly.  
Treatment: Very little can be done to cure the affected animals. Potassium permanganate 1 dram and aluminum sulphate 1 dram dissolved in water and given as a drench has some benefit. Large quantities of melted lard, raw linseed or milk, may be tried. In some cases the use of a stomach tube and quick acting purgative by hypodermic syringe may prove useful.

#### 5. Chokecherry - Prunus virginiana

It is a small shrub with simple alternative leaves, which are oval shaped. Flowers are white and are borne in a dense cylindrical spike. This is poisonous mainly to cattle and sheep, especially during drought or after a frost.

This looks like a saskatoon berry (Amelanchier alnifolia) which has more rounded leaves and the flowers are not borne on cylindrical spikes. The upper leaf margin is faintly serrated or toothed.

Poison: Hyrocynic acid.  
Symptoms: Staggering, convulsions, bloat, frothing, inability to stand and difficult breathing.  
Treatment: For cattle  $\frac{1}{2}$  to 1 dram of potassium permanganate in solution may be given as a drench. Corn syrup or glucose drenches may be tried. For sheep 1 part of sulphur added to 12 parts of salt may be given with some success.

It is better to keep the animals away from dense thickets of this plant while grazing, resting or bedding. Special care should be taken during drought and frosty periods.

#### 6. Milk Vetches - Astragalus bisulcatus (2 grooved milk vetch) Astragalus pectinatus (narrow-leaved milk vetch)

These plants belong to the pea family. Two grooved milk vetch is an erect plant with many leaflets to a leaf. Flowers are reddish purple (rarely white) and are many in number, borne on a long dense raceme. The pods have two grooves on the upper side.

Narrow-leaved milk vetch is mainly a straggling plant. The leaflets are few in number and are very long and narrow. The flowers are few and are cream coloured.

Both the plants contain selenium - a mineral element - which is poisonous to cattle and sheep.



Poison: Selenium.  
 Symptoms: Skin eruptions and sterility in female animal.  
 Treatment: Take the animals off the infested range and put on better quality hay or change to better range.

7. Timber Milk Vetch - Astragalus serotinus

The plant is tufted at the base, with slender stems which are erect or ascending. The leaflets are greenish, and the racemes are many flowered. The flowers are white, pink or blue in colour.

Poisonous mainly to cattle and sheep, but horses are also affected. Lactating (milking) cows, ewes and mares are the most badly affected ones, and suffer heavy losses.

Poison: Not known.  
 Symptoms: Staggering and difficult breathing, foaming at the mouth, bluish tongue and paralysis of the hindquarters.  
 Treatment: Avoid the infested area, take milking cows off and put in male animals and dry cows. The use of Nux Vomica at the rate of 1 - 2 drams for cattle (20 - 40 grains for sheep) once or twice per day for two weeks may prove beneficial.

If the animal becomes restless or excited, the treatment should be discontinued for a week.

8. Loco Weeds - Oxytropis lamberti (White loco)  
Astragalus mollissimus (Woolly loco)  
Astragalus splendens (Showy loco)

Oxytropis and Astragalus look very much alike. Oxytropis has a sharp pointed tip at the end of the keel petal and it is blunt in Astragalus. For easy remembrance, think of the ox - its horns - and the pointed tip of the keel petal of Exytropis.

White loco weed is a silvery white plant with leaves shorter than the flowering stalk. The flowers are usually yellowish white in colour, but it is not uncommon to see flowers varying from white to bluish purple.

Woolly loco or Purple loco weed is white and woolly in appearance. The flowers are deep purple in colour.

These loco weeds are poisonous mainly to horses, but cattle and sheep are also affected. When the animals get the habit of eating loco weeds, they become addicts to eating only loco weeds, even refusing better feed.

Poison: An alkaloid by name locoine and it is a cumulative poison.  
 Symptoms: Nervous system is affected causing loss of muscular control. Senses of sight and hearing are impaired. Animals become crazy or "locoed", leap over small depressions, shy violently at imaginary objects or walk around in circles.  
 Treatment: No antidote is uniformly satisfactory. For horses Fowler's solution of arsenic in doses of 2 drams twice per day in water or mash is suggested. For cattle hypodermic doses of 1/5 grain of strychnine inserted in the shoulder daily for a 30 day period is recommended. Sheep should be put on good nutritive diet, and a dose of 4 ounces of magnesium sulphate would assist.

#### 9. Lupine - Lupinus argenteus

This is an erect bushy plant belonging to the pea family. The leaves are divided into 5 to 9 leaflets arising from the same point (palmately compound). This is mainly poisonous to sheep. The poisonous principle is found mostly concentrated in the seeds.

Poison: A toxic alkaloid.  
 Symptoms: Nervousness, laboured breathing, convulsions and frothing at mouth.  
 Treatment: No method of treatment has proved useful. Sheep may be taken off and cattle may be put in. Avoid lupine areas, especially during the pod bearing season.

Almost all of these poisonous plants can be eradicated or controlled by the use of suitable herbicides. In places where control measures are not possible, prevention is better than cure and this can easily be done by avoiding such poison patches or by delaying grazing in some cases where poisonous plant becomes coarse and unattractive with well grown grass all around.





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PART IV     SOME OF THE RANGE GRASSES

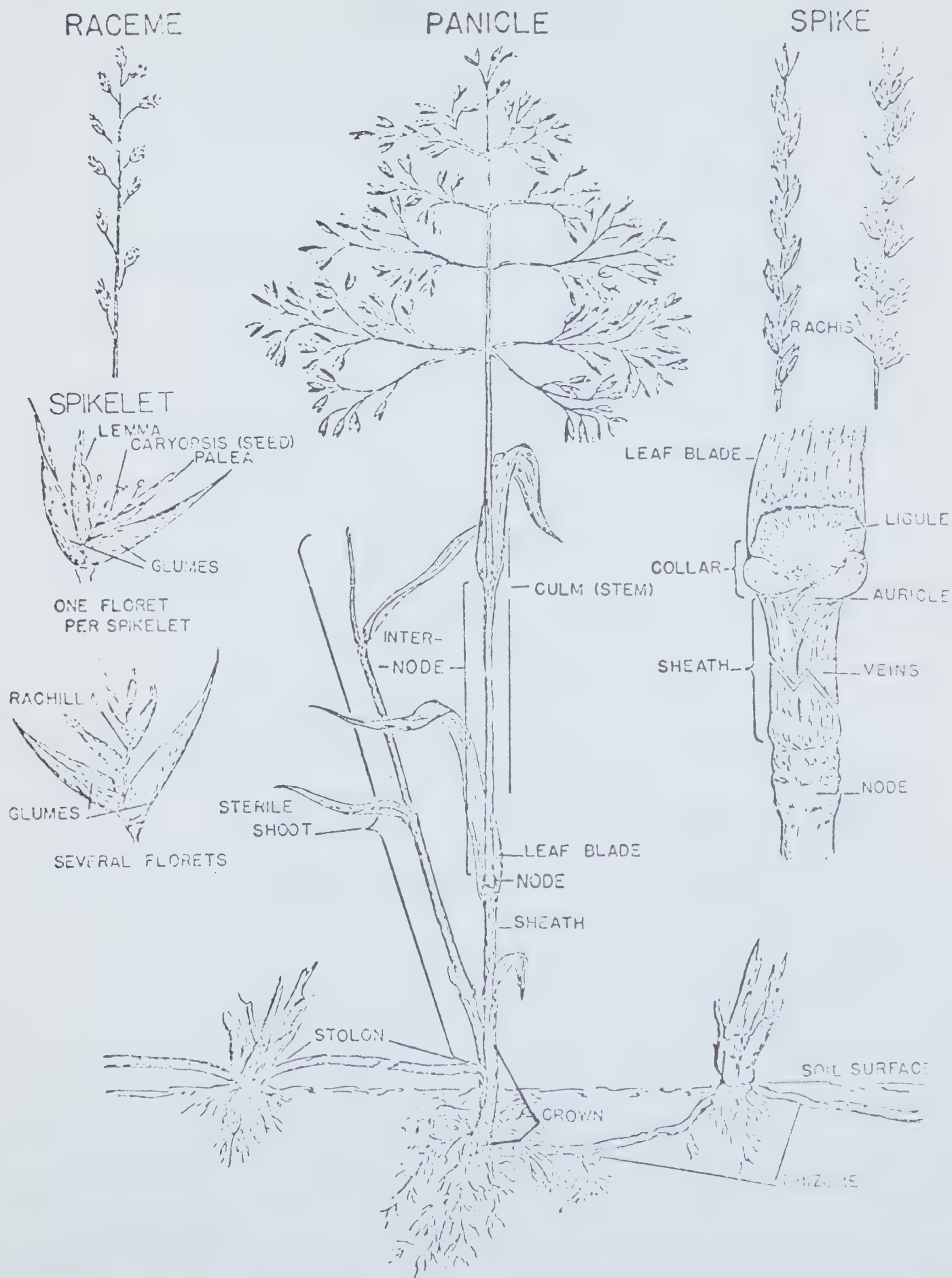
Glossary of Terms

- CULM . . . . . The stem of a grass or sedge.
- DISARTICULATION . . . . . The breaking away of a spikelet at maturity.
- IMBRICATE . . . . . Overlapping, like shingles on a roof.
- INFLORESCENCE . . . . . The manner in which flowers are borne in clusters. (i.e. in a panicle, in a spike, in a raceme etc.). The panicle, spike and raceme are different types of inflorescence.
- INVOLUTE . . . . . Rolled inward.
- RACHIS . . . . . The central axis of a raceme or spike.
- RACHILLA . . . . . The central axis of a spikelet.
- RHIZOME . . . . . An underground stem. Distinguished from a root by the fact that it has nodes and usually bears scale-like leaves.
- SESSILE . . . . . Without a stalk.
- TUFTED . . . . . Bunched. Growing from a localized crown (i.e. Not from a creeping rootstock rhizome.)

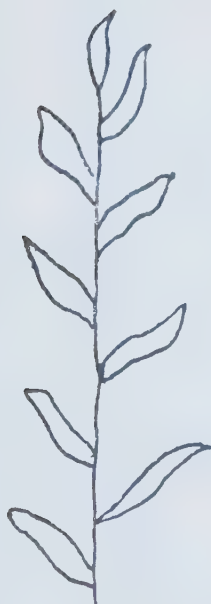




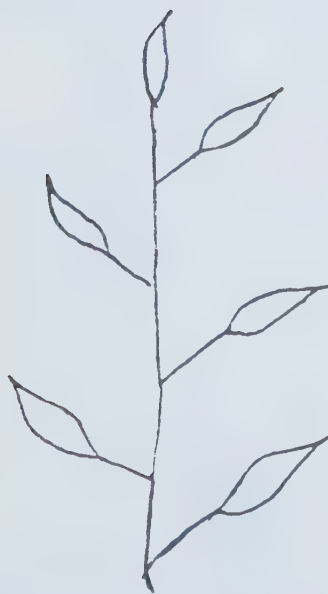
# THE GRASS PLANT



## TYPES OF INFLORESCENCE



1. A Spike (No stalks on spikelets)

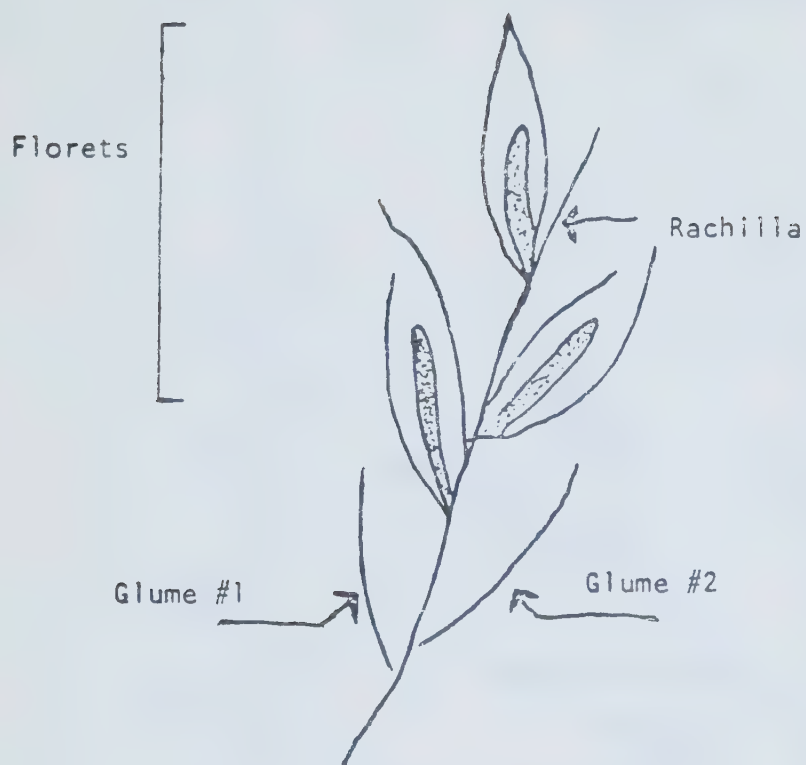


2. A Raceme (Spikelets are stalked)

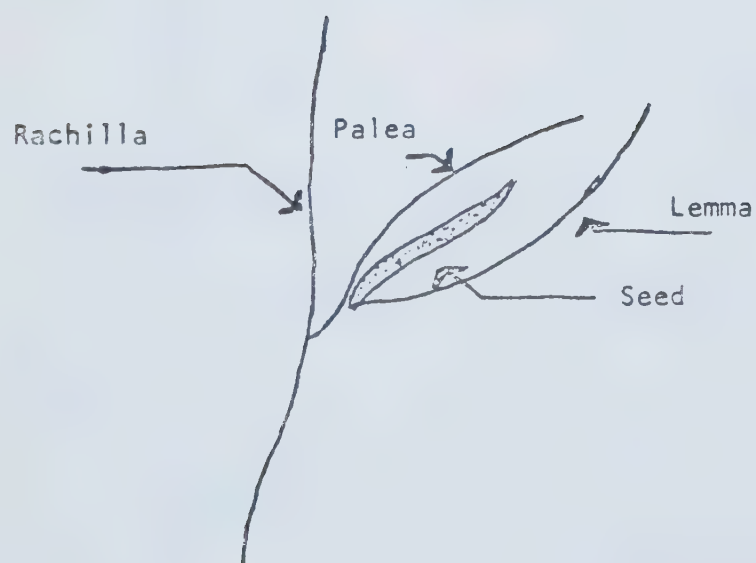


3. A Panicle (A compound raceme)



SPIKELET

1. Diagrammatic representation of a spikelet.



2. Diagrammatic representation of floret.

# 1. Agropyron (Wheatgrass)

Perennials, usually but not always with creeping rhizomes.

Spikelets solitary, one at each node and borne in a spike (i.e. each spikelet is sessile, or without a stalk).

Glumes are shorter than spikelets and remain on the rachis following disarticulation (seed fall).

The auricle is clawed in most species encountered, while the ligule is inconspicuous to the point where it may appear to be absent.

The common garden weed, quack grass, is a familiar representative of this genus. Other species found in our area include:

## Agropyron cristatum (Crested wheatgrass)

An introduced species, often used for seeding roadside embankments, and easily recognized by the "herringbone" appearance of the flowering spike both before and after disarticulation of the spikelets.

## Agropyron spicatum (Bluebunch wheatgrass)

Spikelets rather widely spaced on the rachis, (barely overlapping). Awns arising from the lemma, and approximately at right angles to the rachis.

## Agropyron smithii (Western wheatgrass)

Mainly distinguishable by a pronounced bluish colour (over the whole plant). Spikelets are closely overlapping (imbricate) on the rachis. Leaves typically make an angle of 45 degrees with the stem.

## Agropyron trachycaulum (Slender wheatgrass)

A tufted species, (i.e. lacking rhizomes).

The flowering spike often has the appearance of being slightly curved. Spikelets overlap on the rachis.

Stems may be reddish in colour at the base.

## Agropyron trachycaulum var. unilaterale (Awned wheatgrass)

A variety of the above species in which there are conspicuous awns and spikelets have the appearance of being confined to one side of the rachis.

Also encountered are:

## Agropyron dasystachyum (Northern wheatgrass)

## Agropyron intermedium (Intermediate wheatgrass)

## Agropyron enerve (Beardless wheatgrass)

## Agropyron subsecundum (Awned wheatgrass)

## 2. Festuca (Fescue)

Mainly perennial with densely tufted growth habit. Inflorescence usually a narrowish panicle with a stiff erect appearance. Glumes remain on the rachilla following disarticulation. Leaves erect, involute, (rolled), and bristle-like. Junction of leaf and sheath often indistinct because of stiffness of leaf. Ligule indistinct or absent. Our most common species are:

### Festuca scabrella (Rough fescue)

Dense tufts or tussocks with persistent basal sheaths from old growth forming a cushion-like mat (up to two feet or more in diameter where growth has been long-standing and vigorous). Leaves up to 20" long, involute, stiff and rough to the touch on the margins. Inflorescence a fairly compact, ascending (erect) panicle.

### Festuca idahoensis (Idaho or Bluebunch fescue)

Grows in dense tufts. Leaves fine, wiry-looking and involute. Plants usually have a bluish tinge, and this feature enables them to be readily distinguished in denser associations of other (taller) species. This species is extremely variable as to size, length of seed-stalk, and even colour in some cases, but it is almost invariably contained in the "lower storey" of a grass sward, and the above description should be adequate.

Another (introduced) species of the genus is Festuca rubra (Creeping red fescue), which, as the name suggests, has underground stems (rhizomes). Leaves are basal and bright green, while sheaths are reddish in colour. Festuca rubra has been suggested a suitable species for reseeding overgrazed areas, but will have to be tested in our allotments before (possibly) being used on a large scale.

## 3. Danthonia (Oatgrass)

Clumped or tufted perennials.

Leaves usually light green, mainly basal, slightly hairy.

Ligule an inconspicuous fringe of hairs, with more prominent tufts at the margins of the collar.

Spikelets few, usually 2 - 8, and large, borne in small panicles.

Florets awned from the lemma, about 1 cm. long.

Main species in our area are:

Danthonia parryi (Parry oatgrass)

Basal leaf sheaths persisting from former growth (although old leaves themselves are deciduous).  
Stems up to 2 ft. tall.  
Leaves about 10" long, mostly basal.  
Glumes almost enclosing spikelets.  
Lemmas awned, awns being 1 - 1½ cm. long.  
Ligule as described above.

Danthonia intermedia (Wild or timber oatgrass)

Tufted growth. Smaller than Parry oatgrass. Stems up to 20" tall. Distinguishable from Danthonia parryi by the sheath, which is hairy.

4. Stipa (Spear or needle grass)

Perennial bunch grasses. Erect, sharp-pointed.  
Sheath split, prominently veined.  
Auricles absent. Ligules variable (see below).  
Inflorescence an open or closed panicle with 1-flowered spikelets.  
Glumes bristle-tipped. Florets (and of course seeds), strongly awned from the lemma, awns being conspicuously twisted.  
Main species for recognition are:

Stipa richardsonii (Richardson needle grass)

Stems up to 3½ ft. tall. Leaves mainly basal.  
Inflorescence a panicle, widely spreading at maturity and superficially resembling that of Deschampsia (see below). Ligule very short and blunt.  
Awns 2 - 3 cm. long, and in this and other species of Stipa seeds are readily disengaged at, and shortly before, maturity. This can be shown by rubbing the hand gently up over the inflorescence so that the awns are caught and come away from the plant complete with the seed.

Stipa spartea (Porcupine grass)

Stems up to 3½ ft. tall.  
Seeds very prominently awned, awns being 3" or more in length. Spikelets are few, and the inflorescence is much less open than in Stipa richardsonii. (i.e. somewhat resembling Danthonia). In addition to the awn, seeds of this species also bear a sharp-pointed callus at the lower end.



Stipa columbiana (Columbia needle grass)

Stems usually about 2 ft. tall.  
 Inflorescence a narrow panicle (i.e. not spreading).  
 Florets (and seeds) awned from the lemma, awns being  
 1 - 1½" long.

Stipa viridula (Green needle grass)

Stems up to 30" or more in height.  
 Leaves narrow (1 - 3 mm. wide), and up 25 cm. long.  
 The ligule is short (1 - 2 cm.) and there are conspicuous  
 tufts of hair at the margins of the collar.  
 There is no sharp-pointed callus on the seeds of this species,  
 and the awns are about 1 - 1½" long.

Stipa comata (Needle and Thread grass or Spear grass)

Stems 12 - 24 inches tall. Panicle 4 - 8 inches long,  
 open and loosely spreading. The base of the inflorescence  
 is commonly enclosed by the uppermost leaf sheath.  
 Leaves 3 - 8 mm. wide, 5 - 30 cm. long.  
 Ligule very conspicuous, membranous, up to 4 mm. long.  
 Awn 3 - 4" long. Seed ½" long.

5. Bromus (Brome grass)

Mostly perennial, but one annual species (Bromus tectorum) is widespread.  
 The genus can be described as follows:

Leaves are broad and flat with a pronounced 2-ranked appearance.  
 The sheath is closed, and there is clearly visible ligule whose  
 length varies with the species.

The inflorescence is an open panicle, often somewhat drooping with  
 large spikelets which usually have a distinctly flattened or  
 keeled appearance.

The glumes are short in relation to the spikelets, usually not  
 covering the first (lowest) floret.

Stems rapidly become woody in the course of the growing season,  
 and isolated plants whose heads have been grazed off may readily  
 be recognized by their comparative stiffness and typical 2-ranked  
 appearance of the leaves.

Main species likely to be encountered are:

Bromus inermis (Awnless brome)

Perennial with creeping rhizomes.  
 Spikelets erect, purplish or brownish.  
 Auricles absent.  
 Ligule clearly visible.

Bromus ciliatus (Fringed brome)

Perennial. Lower sheath usually visibly hairy.  
Auricles absent.  
Ligule visible.  
Spikelets drooping and visibly awned from the lemma.

Bromus tectorum (Cheat grass or downy chess)

Annual, with a purplish tinge.  
Very early-flowering, the inflorescence having a purplish tinge, and a somewhat silky appearance.  
This is a weedy species, and has little forage value except in the earliest stages of vegetative development.

6. Phleum (Timothy)

An easily recognized genus, with tufted growth habit from a basal crown of numerous swollen stem sections.  
Leaves are soft and light green in colour.  
Ligule prominent. Auricles absent.  
The inflorescence is a dense cylindrical spike-like panicle having a typical "bottle-brush" appearance.  
Two species are found in our area:

Phleum pratense (Timothy)

Up to approximately 3 ft. tall.  
Leaves about 6" long in grown plants.  
Ligule conspicuous and often pointed.  
The flowering head about 4" - 6" long.

Phleum alpinum (Apline timothy)

Very similar to the above but with noticeably slender stems (culms).  
The inflorescence is short, being not much more than one inch in length.  
Main leaves about 4" long.  
Ligule prominent but not pointed.

7. Deschampsia (Hairgrass)

Densely tufted perennials found in wet habitats and open mountain slopes.  
Only one species need concern us, this being:

Euschampsia caespitosa (Tufted hairgrass)

Erect, tufted, and with leaves mainly basal.

Leaves deep green and folded.

Prominent swelling at junction of leaf sheath and blade.

Ligule very prominent, up to 1 cm. long, pointed and often split.

Inflorescence a very open large panicle with silvery looking spikelets which shine in the sunlight.

Lemmas awned from the base, usually 2 florets per spikelet.

This species is found in wet marshy habitats, along creek banks, etc.

c. Koeleria (Junegrass)

Represented in our area by one species:

Koeleria cristata (Junegrass)

Perennial with tufted growth.

Stems (culms) up to 3 ft. but most commonly less than 2 feet. No auricles.

Ligule about 1 mm., often split.

Leaves up to 5" long, but usually less, flat and pale green, mainly basal and frequently slightly withered at the tip.

Inflorescence superficially resembles that of timothy, but closer examination reveals it to be a branched panicle.

This opens out slightly at anthesis (when pollen is produced).

The species is common on drier sites and somewhat lighter/poorer soils.

d. Poa (Bluegrass)

Mostly perennials.

Main distinguishing feature is a boat-shaped leaf tip.

Inflorescence usually a somewhat erect, narrow panicle (i.e. species in our area.)

Spikelets tend to be laterally compressed, or "keeled".

Auricles absent.

Ligule variable and not too useful in identification, being very conspicuous in some species (i.e. Poa secunda), but very small in others (i.e. Poa pratensis).

Several species occur in our area.

# 10. Elymus (Wild rye)

The inflorescence may easily be confused with that of Agropyron spp., since spikelets are crowded into a spike and are also sessile. Spikelets are, however, in pairs, being 2 to each node of the rachis. Growth is tufted, and usually from creeping rhizomes.

The most common species in our allotments is:

## Elymus innovatus (Hairy wild rye)

Growth from creeping rhizomes with stems up to 3 ft. or slightly more.

Leaves flat, considerably wider than those of the frequently associated Calamagrostis rubescens (see below) and of a conspicuously light green when growing in open sites. Usually found in timbered areas.

The auricles are clawed and in this respect also resemble Agropyron. The ligule is inconspicuous.

The inflorescence has a pronounced hairiness which, together with a distinctly purplish-green colour, helps in identification of the species.

# 11. Calamagrostis (Reed grass)

The genus can be associated with the understorey of the more open coniferous forests (and to a lesser extent with that of deciduous forests as well), but also forms a significant component of the vegetation on open, upland meadows (i.e. Calamagrostis rubescens and Calamagrostis montanensis), or low-lying marshy sites (i.e. Calamagrostis canadensis and Calamagrostis inexpansa).

A prominent ligule (of varying shape) is common to all species, while seeds bear a ring of white hairs (callus hairs) at the base. Both tufted and rhizomatous spp. occur within the genus, both types being mainly tall (i.e. 2 - 4 ft. stems).

Leaves slender, and light green.

No auricles. Spikelets are single flowered.

Inflorescence a dense, usually somewhat compact panicle.

Our most common species is:

## Calamagrostis rubescens (Pinegrass, or Pine reed grass)

Grows from creeping rootstocks, often forming a fairly thick, pure stand under lodgepole pine, or, less commonly, poplar. Slender stems up to 2 ft. tall, but usually 1½ - 2 ft.

The species heads sparingly under trees, but more so in the open.

The inflorescence has a pronounced reddish tinge. Frequently associated with hairy wild rye, but easily distinguished from that species on the basis of ligule and leaf-width characteristics, as well as by the inflorescence, when this is present.





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## PART V      PASTURE MANAGEMENT

### The Site

The soil should be suitable and it should not be too wet or too sandy or very clayey. The area should have at least 12 inches of precipitation well spread out through the year. The seed should have 50 - 60 days of favourable period. The area should be fairly level.

### The Seedbed

Competition from other plants should be removed. Weeds and other trash vegetation should be removed and a good seedbed be prepared. Shallow seeding is preferred and drilling is better than broadcasting. For better germination, the soil should be packed around the seed a little. A clean fallow land offers a good seedbed. In sandy areas, undisturbed stubble provides a good seedbed. If stubble is not available a light seeding of oats can provide some protection to the seedlings. For heavy-textured grey wooded soil, packing the soil after seeding is not favoured, but a cloddy seedbed and a higher seed rate should be good.

### Seeding Time

We have two sowing periods - one in early spring and the other in late fall. Local conditions should indicate the exact time to seed. It is better to seed as soon as conditions permit after a soaking rain. If it is an irrigated pasture seeding need not depend on the rain. Fall seeding is not very good for legumes. Fall seeding should be done at such a time that seeds do not sprout and are winterkilled.

Certified seed should be used to ensure success. If legume seeds are used proper inoculum should be used.

### Management

If irrigation is available, pasture may be irrigated whenever it is necessary. Fertilizer can be applied to increase the quality and quantity of forage.

During the first year the pasture should not be grazed. During the second year pasture may be grazed lightly during the later part of the season. Pasture should not be grazed when the soil is wet. Rotational grazing is a good thing to practice with the help of different paddocks. Three weeks rest or more is advisable. It varies according to the time of the year, as growth rate during fall is much slower than the growth during spring.

In order to have uniform leafy growth mowing can be done occasionally. Cattle droppings should be spread out evenly and this can be done by harrowing. Mowing will help to increase the palatability if done when the forage growth becomes too advanced. During certain seasons there may be some surplus forage available and this should be removed for hay or silage.

Weeds should be kept in check. It is better to keep the animals off the pasture for a few days immediately following the use of chemical weedicides.

Water and salt should be made available to livestock at all times. Animals should not be made to walk long distances to get these. In times of stress when the pasture is not able to feed all the animals, supplemental feeding should be resorted to.

### Hay

If a pasture is used for cutting hay, it should be properly fertilized to produce high quality hay. Good hay contains a high percentage of protein, and vitamin A in the form of carotene. Leaves contain most of these nutrients and bright green colour indicates quality in regards to carotene content. So while making hay the plants should be cut at the proper stage and cured to keep all the leaves and the bright green colour.

The best time to cut for hay varies with the crop. Grasses give the best results when cut between heading and blooming, alfalfa when it is 10% in bloom, and clover just after full bloom.

Generally pastures should not be kept going for more than five years. At the end of five years, it is better to plough up and reseed them.

### Some of the Recommendations with regard to seed mixtures

#### 1. Pasture

##### (a) Driest area

Nordan/Summit Crested wheatgrass or Russian Wild Rye	6 lb.	
Rambler alfalfa	1 lb.	per acre

##### (b) For all other areas

Brome	6 lb.	
Creeping Red Fescue	3 lb.	per acre
Rambler and Ladak alfalfa	2 - 3 lb.	

##### (c) Short term pasture under irrigation

Brome	12 lb.	
Alfalfa	2 lb.	per acre

- (d) Long term pasture under irrigation
- |                       |       |          |
|-----------------------|-------|----------|
| Brome                 | 7 lb. |          |
| Chinook Orchard grass | 7 lb. |          |
| Creeping Red Fescue   | 4 lb. | per acre |
| White Dutch Clover    | 2 lb. |          |
- (e) For Zone 2
- |                                    |       |          |
|------------------------------------|-------|----------|
| Russian Wild rye, Nordan or Summit |       |          |
| Crested wheatgrass                 | 6 lb. |          |
| Rambler alfalfa                    | 2 lb. | per acre |
- (f) For Zones 2 and 3
- |                                     |       |          |
|-------------------------------------|-------|----------|
| Brome                               | 8 lb. |          |
| Rambler or Ladak Alfalfa            | 3 lb. | per acre |
| or Brome                            | 6 lb. |          |
| Nordan or Summit Crested Wheatgrass | 3 lb. | per acre |
| Rambler or Ladak alfalfa            | 3 lb. |          |

## 2. Hay

- (a) Driest area
- |                                     |       |          |
|-------------------------------------|-------|----------|
| Brome                               | 5 lb. |          |
| Nordan or Summit Crested wheatgrass | 3 lb. | per acre |
| Rambler alfalfa                     | 2 lb. |          |
- (b) For all other areas
- |                          |       |          |
|--------------------------|-------|----------|
| Brome                    | 6 lb. |          |
| Rambler or Ladak alfalfa | 5 lb. | per acre |
- (c) Areas of plentiful moisture
- |                                 |       |          |
|---------------------------------|-------|----------|
| Climax Timothy                  | 3 lb. |          |
| Beaver, Ladak or Vernal alfalfa | 5 lb. | per acre |
- (d) Wet locations subject to flooding
- |                |       |          |
|----------------|-------|----------|
| Climax Timothy | 3 lb. |          |
| Alsike Clover  | 4 lb. | per acre |
- (e) Areas subject to prolonged flooding
- |                            |       |          |
|----------------------------|-------|----------|
| Frontier Reed Canary grass | 3 lb. |          |
| Climax Timothy             | 1 lb. | per acre |
| Alsike Clover              | 4 lb. |          |
- (f) Grey Wooded or Black Soil areas with plentiful moisture
- |                      |       |          |
|----------------------|-------|----------|
| Brome                | 6 lb. |          |
| Altaswede Red Clover | 5 lb. | per acre |
| or Climax Timothy    | 3 lb. |          |
| Altaswede Red Clover | 5 lb. | per acre |



### 3. Pasture or Hay

- (a) For Zones 2 and 3 where moisture conditions are variable
  - Brome 5 lb.
  - Nordan or Summit Crested wheatgrass 3 lb. per acre
  - Rambler or Ladak alfalfa 3 lb.
- (b) Wet locations subject to flooding
  - Frontier Reed Canary Grass 5 lb.
  - Climax Timothy 1 lb. per acre
  - Alsike Clover 2 lb.
- (c) For acid soils subject to flooding
  - Red Top 5 lb.
  - Alsike Clover 2 lb. per acre

Note: See the attached 'Major Soil Climatic Zones Map'





### Some Fertilizer Recommendations

#### I. Zone 1 - Light Brown Soil

120 to 240 lbs. of 21-0-0 fertilizer/ac. Broadcast in fall.

#### II. Zone 2 - Dark Brown and Thin Black Soil

For pastures with grass alone.

150 to 450 lbs. of 21-0-0 fertilizer/ac. Broadcast in early fall or early spring.

For pastures with less than 25% legume.

80 to 160 lbs. of 27-14-0 fertilizer/ac.

For pastures with more than 25% legume.

75 to 150 lbs. of 11-48-0 fertilizer/ac.

#### III. Zone 3 - Black and Dark Grey Wooded Soil

For pasture with grass alone.

150 to 450 lbs. 21-0-0 fertilizer/ac. Broadcast in early fall or early spring.

For pastures with less than 25% legume.

100 to 200 lbs. of 27-14-0 fertilizer/ac.

For pastures with more than 25% legume.

100 to 175 lbs. of 11-48-0 fertilizer/ac.

#### IV. Zone 4 - Grey Wooded Soil

For pasture with grass alone.

100 to 200 lbs. of 21-0-0 fertilizer/ac.

For grass - legume mixture.

100 to 150 lbs. of 16-20-0 fertilizer/ac.

Note: If there is a higher percentage of legume in the mixed pasture, phosphorus content in the fertilizer should be increased and nitrogen should be reduced.





I. SOIL CONDITION

- Class 1.** No soil loss or erosion; no evidence of accelerated erosion, topsoil layer intact; well-dispersed accumulation of litter plus older litter, 0 - 20% bare ground . . . . . 15
- Class 2.** Soil movement slight and difficult to recognize; small deposits of soil at end of small gullies or accumulations back of plant crowns or litter; rill marks may be observed; litter not well dispersed, no accumulation from past years' growth, 20-40% bare ground . . . . . 12
- Class 3.** Soil movement or loss more noticeable; topsoil loss evident; may be some pedestaled and hummocked plants; rill marks and alluvial deposits may be seen; poorly dispersed litter; bare spots not adequately protected by litter and soil, 40-60% bare ground . . . . . 8
- Class 4.** Soil movement and loss readily recognizable; topsoil remnants with vertical sides and exposed plant roots; plants raised above the general level of the surface soil by loss of soil around them, roots frequently exposed; terraces active; erosion pavement forming; recent alluvial deposits. Advanced erosion seen, over 60% bare ground . . . . . 0 - 5

II. DENSITY

- Class 1.** 45% and over = 9-10 points      **Class 3.** 15% to 30% = 3-5 points
- Class 2.** 30% to 45% = 6-8 points      **Class 4.** Less than 15% = 0-2 points

III. COMPOSITION AND AGE

- Class 1.** Better perennial herbaceous forage plants abundant, age classes of 1-, 2-, 3-year, and older plants represented. Better forage plants available to livestock, growing in openings between shrubs. Desirable plants 50% . . . . . 15
- Class 2.** Better perennial herbaceous-forage plants moderately abundant, age classes of 1-, 2-, 3-year, and older plants represented. Secondary plants moderately abundant to abundant. Better forage plants available to livestock, growing in openings between shrubs. Desirable 25-49% or Intermediate over 75% . . . . . 10
- Class 3.** Better perennial-herbaceous-forage plants scarce, older plants only are found, may be a few seedlings present. Low value or unpalatable plants abundant. Better forage plants confined to protection of shrubs, not commonly found in openings. Desirable 10-24% or Intermediate over 50% Undesirable over 25% . . . . . 7
- Class 4.** Better perennial herbaceous-forage plants generally found as relics. Low value or noxious plants abundant, represented by age classes. Annuals may be moderately abundant to abundant. Better forage plants confined to protection of shrubs. Desirable 10% or Intermediate under 50%. Undesirable over 50% . . . . . 1 - 2

IV. PLANT VIGOUR

- Class 1.** Palatable plants vigorous. Grasses robust with numerous leaves, seed-stalks tall and numerous, leaves dark green. No hedged or high-lined browse. Forage plants reproducing. 78% of maximum . . . . . 10
- Class 2.** Palatable plants lack vigour, forage grasses are shorter, fewer seed-stalks. Seedlings may be present. Few forage plants of younger age classes represented. Less palatable plants generally vigorous. 51-77% of maximum. . . . . 7
- Class 3.** Palatable plants lack vigour, grasses weak, forage plants are not reproducing. 36-50% of maximum . . . . . 5
- Class 4.** Palatable plants sickly and weak. Grasses may be pale, seedstalks few and short, no seedlings. No reproduction of palatable plants, sod thinning. Under 35% of maximum. . . . . 1

RANGE CONDITION RATINGS

Good condition	over 40 points *
Fair condition	30 - 40 points
Poor condition	15 - 29 points
Very poor condition	0 - 14 points

\* Total points from Soil condition, plant density, composition and vigour



I. TYPE OF INFLORESCENCE

Single Spike (TRIBE HORDEAE)

Spike

Multiple Spike, Spikelets arranged on one side of rachis (TRIBE CHLORIDEAE)

Panicle

1. Single spikelet to a node - AGROPYRON
2. Two spikelets to a node - ELYMUS
3. Three spikelets to a node - HORDEUM

1. Short dry land grass - BOUTELOUA
2. Found in moist areas - BECKMANNIA

II. NUMBER OF FLORETS (seeds) TO THE SPIKELET

Single Floret to the Spikelet (TRIBE AGROSTIDEAE)

More than one Floret to the Spikelet

1. Spikelet cylindrical inflorescence - PHLEUM
2. Spikelets usually large with long awns - STIPA
3. Spikelets small with a ring of hair at the base of the lemma - CALAMAGROSTIS
4. Spikelets very small, Panicle usually loose - AGROSTIS
5. Panicle very lax, leaves mainly basal - ORYZOPSIS
6. Panicle close, slender - MUHLBERGIA

III. LENGTH OF GLUMES

Glumes longer than the Florets (TRIBE Aveneae)

Glumes shorter than Florets (TRIBE Festuceae)

1. Spikelets large and few in number - DANthonIA
2. Spikelets glister in sunlight, found in moist areas - DESCHAMPSIA
3. Panicle compact - KOELERIA
4. Similar to Koeleria, but with awns - TRisetum
5. Spikelets large and pendulous, Plants annual - AVENA
6. Spikelets large and erect, Plants perennial - HELICTOTRICHON

1. Panicle usually loose, spikelets large - FROSTUS
2. Leaf tip boat shaped - POA
3. Leaves rolled up and appear needlelike - FESTUCA
4. Spikelets long, slender, awned and purple spotted - SCHIZACHNE
5. Similar to 4, one species has a bulb - MELICA
6. Grows in water, spikelets striated - GLYCERIA





# RANGE PLANT GROUPS

D. DECREASED OR DESIRABLE PLANTS	COMMON NAME	SYMBOL
Agropyron smithii	Western Wheatgrass	Asm
Agropyron spicatum	Bluebunch Wheatgrass	As
Agropyron spp.	Wheatgrass	Asu
Avena hookeri	Hookers Oat Grass	Am
Bromus inermis	Awnless Brome	Bin
Bromus spp.	Brome Grass	BRO
Danthonia parryi	Parry Oat Grass	Dpa
Deschampsia caespitosa	Tufted Hair Grass	Dea
Festuca scabrella*	Rough Fescue	Fsc
Festuca idahoensis*	Bluebunch Fescue	Fid
Festuca ovina	Sheep Fescue	Fov
Phleum pratense	Timothy	Ppr
Stipa richardsonii*	Richardson Needle Grass	Sri
Vicia spp.	Vetch	VIC
Lathyrus spp.	Pea Vine	LAT
Trifolium spp.	Clover	TRI
Festuca rubra	Red Fescue	Fru
Hedysarum spp.	Sweet Broom	HEU

I. INCREASED OR INTERMEDIATE PLANTS	COMMON NAME	SYMBOL
Agrostis scabra*	Rough Hair or Tickle Grass	Asc
Carex	Sedge	CAR
Calamagrostis canadensis	Reed Grass	Can
Calamagrostis rubescens	Pine Grass	Crn
Danthonia intermedia*	Timber Oat Grass	Din
Elymus canadensis	Wild Rye	ELY
Loelera cristata*	June Grass	Ker
Muhlenbergia spp.	Muhly Grass	Muh
Poa pratensis*	Kentucky Bluegrass	Ppr
Poa spp.	Bluegrass	POR
Stipa spp.	Needle Grass	STI
Agoseris spp.	False Dandelion	AGA
Balsamorhiza sagittata*	Balsam Root	BBA
Lupinus spp.	Lupine	LOP
Mertensia spp.	Bluebells	MER
Astragalus spp.	Milk Vetch	AST
Oxytropis spp.	Loco Weed	OXY
Schizachne purpurescens	False Melic/ Purple Oatgrass	Spu
Aster spp.	Aster	AST
Valeriana spp.	Valerian	VAL
Geranium spp.	Cranes Bill	GER



7. INVADERS OR UNDESIRABLE PLANTS	COMMON NAME	SYMBOL
<i>Achillea lanulosa</i>	Common Yarrow	ACH
<i>Anemone</i> spp.*	Anemone	ANE
<i>Antennaria</i> spp.*	Pussytoes - Everlasting	ANT
<i>Artemisia frigida</i> *	Pasture Sagewort	AFR
<i>Bromus tectorum</i> *	Downy Chess	BTE
<i>Cirsium</i> spp.	Thistle	CIR
<i>Fragaria</i> spp.	Strawberry	FRA
<i>Geum triflorum</i> *	Old Man's Whiskers. Prairie Smoke	CTR
<i>Geum</i> spp.	Avens	GEU
<i>Juncus</i> spp.*	Rush	JUN
<i>Leontodon</i> spp.* (Tarasacum)	Dandelion	LEO
<i>Penstemon</i> spp.	Beard-tongue	PEN
<i>Potentilla fruticosa</i> *	Shrubby Cinquefoil	PFR
<i>Potentilla</i> spp.	Cinquefoil	POT
<i>Pulsatilla</i> spp.	Pasque flower / Prairie Crocus	PUL
<i>Symphoricarpos</i> spp.	Snowberry	SYM
<i>Solidago</i> spp.	Goldenrod	SOL
<i>Galium</i> spp.	Bedstraw	GAL
<i>Erigeron</i> spp.	Wild Daisy, Fleabane	ERI
<i>Thalictrum</i> spp.	Meadow Rue	THA

Key indicator species (not all will be of indicator value in any one site;





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COMMENTARY ON RANGE MANAGEMENT SLIDES

1. A typical range - It is a wide open country. You can visualize the differences between a pasture and a range. In a range the area is very large, soil is not arable, very little of fencing and you find beef cattle.
2. A range in good condition - Soil seems to be good because you can see good growth of plants. Vegetation is thick and soil seems to be well covered. Vegetation appears to be mainly of palatable perennial grasses. The individual plants appear to be robust. In other words the condition of the soil is good, plant density or cover is good, plant composition is good and plant vigour is good. These are the four major factors used in our score card to judge the condition of the range.
3. A fence line contrast - Here you see the difference between the grazed and ungrazed area.
4. A range in poor condition - You see a large portion of the area is fully exposed with no vegetation at all. A large amount of bare ground can be very critical and easily be subject to erosion. Poorer vegetation can be expected in such areas. The size of the plants can indicate the poor vigour of the plants. When the range condition comes down to this stage, we have to take very active or drastic steps to bring it back to the original good condition.
5. Vigour of plants - The plant is the same on either side. It is Junegrass. On one side you see three single plants with roots and one stem. On the other side there is one single plant showing good vigour. Vigour can be judged by the size or the thickness of the clump, the height of the plant, the size (length and width) of leaves, the number of stems and the number of seed heads. What you do not notice in composition alone, you can observe in vigour. So all factors should be considered together and not individually by themselves.
6. Effects - invisible - Some of the bad effects of improper grazing cannot be seen unless you make an effort to dig up the plants. Overgrazing and grazing from the very early season when the plants are not ready can cause this effect - poor development of roots. When there is poor growth of roots, we can expect poor growth of plants in the succeeding seasons. You can note that the poorest development of root is obtained where the grass is grazed close to the ground not leaving the crown portion. The one in the middle shows moderate grazing and the crown portion (which along with the root stores food in reserve for the future plant) is left ungrazed. At the end of the grazing season we should see that a decent amount of carryover is left to bring forth vigorous plants the following year.

7. This is Tall Larkspur (*Delphinium scopulorum*) - Note the leaves are alternate in contrast to geranium where the leaves are opposite. The stem is hollow, unlike geranium stem. Consumption of this plant equal to 0.1% or more of the body weight of the animal is fatal. This is mainly poisonous to cattle and not to horses and sheep. Affected animals may be saved if a subcutaneous injection of Physostigmin salisylate 1 grain, Pilocarpin hydrochloride 2 grains and strychnine sulphate  $\frac{1}{2}$  grain dissolved in water is given immediately. This is not always possible and so it is easier to avoid larkspur poisoning by other methods. Delayed grazing will allow this plant to grow much taller than grasses and the cattle are likely to avoid this. Feed your cattle with an extra dose of phosphorus among your minerals during the winter months. Feed your cattle for the first few days with hay and minerals when they first enter the range. This will lessen perverted appetite. Root out the plants by mechanical or chemical means.
  
8. This is Water Hemlock (*Cicuta maculata*) a poisonous plant of the wet or moist areas. The leaves are bi- or tripinnately compound. The basal portion of the stem and tuberous roots show partitions when cut open. The plant is poisonous to all livestock. All parts of the plant are poisonous and a small tuber is enough to kill a cow. The plant should be avoided by fencing it off or be eradicated by grubbing out the roots. Very little can be done to cure the affected animals. A drench containing potassium permanganate 1 dram and aluminum sulphate 1 dram may give some beneficial effect.
  
9. This is Arrow Grass (*Triglochin maritima*) - This is not a grass, but looks like one with spongy round leaves. The inflorescence appears like a spike. The plant grows near marshy areas and saline flats. All parts of the plant are dangerous at all times. It is poisonous to cattle and sheep. When the ground is frozen or when a wet meadow dries up, animals have easy access to this plant and losses may be heavy. It is not very common in the forest areas. The plant contains hydrocyanic acid. Affected animals show muscular spasms, chomping of the jaws and hard breathing. There is no sure treatment and the poison is an extremely quick acting one. Corn syrup drenches can be tried. Intraperitoneal injection of 2 grams of sodium thiosulphate and 1 gram of sodium nitrate in a 20% water solution is recommended. Heavy salting, careful herding and fencing worst areas would prevent cattle losses. The plant contains a high percentage of salt, making the plant quite palatable, hence heavy salting is recommended.

10. This is Death Camas (*Zygadenus gramineus*) - This is mainly poisonous to sheep, even though cattle and horses may be affected to a small extent. This is found mainly in the prairie region. Unlike bronze bells and smooth camas which are not poisonous, this plant has the flowers bunched up at the tip of the inflorescence. This occurs generally in overgrazed ranges. By delayed or deferred grazing sheep may be made to avoid this plant. Affected animals should be kept quiet and provided with good feed and water. If available "Death Camas Tablets" may be given.
11. This is Lupine (*Lupinus argenteus*) and it is mainly poisonous to sheep. Even in the dry hay it is poisonous and the seeds contain more poison than the other parts of the plant. No method of treatment has proved useful. Cattle may be used to graze lupine infested area. Sheep may be kept off the area at least during the pod bearing season.
12. This is Woolly or Purple Loco weed (*Astragalus mollissimus*). This is one of the loco weeds which belong to the genera *Astragalus* and *Oxytropis*. This is mainly poisonous to horses, but cattle and sheep can be affected. No antidote is uniformly satisfactory. For horses Fowler's solution of arsenic in doses of 2 drams twice per day in water or mash is suggested. For cattle, hypodermic doses of 1/5 grain of strychnine inserted in the shoulder daily for a 30-day period is recommended. Sheep should be put on good nutritive diet and a dose of 4 ounces of magnesium sulphate would assist.
13. Multiple use of forest land - From the forest land we get water, timber, forage, recreation and wildlife. All these resources can be made use of in the same place and at the same time provided there is no conflict. Resources are to be used, but very judiciously and that is conservation. Locking up the resources by non-use is not conservation. Use should be made carefully so that the benefit or the enjoyment can be obtained perpetually or on a sustained yield basis. At all times water should be considered as of prime importance. The use of timber and forage can go hand in hand in the same place at the same time. However, where reforestation program is going on, livestock grazing should be avoided. Except elk, most of the big game animals do not compete so much for the same forage with cattle. They are mainly browsers. Some people do not like the presence of livestock near the recreation areas. If necessary, livestock can be taken away from such areas. Avoid conflicts between the different uses. Money is not all in all the final criterion.

### SOME USEFUL DATA

One Rod	=	$16\frac{1}{2}$ feet	=	$5\frac{1}{2}$ yards
One Chain	=	4 rods	=	66 feet = 22 yards
One Mile	=	80 chains	=	5280 feet = 1760 yards
One Section	=	one square mile	=	16 legal subdivisions = 640 acres
One Legal Subdivision	=	40 acres		
One Acre	=	69.56 yards square	=	4840 square yards = 43560 square feet
One Pound (lb.)	=	16 ounces (oz.)	=	453.6 grams (gms.)
One Ounce	=	28.35 gm.		

A circle with 21 inches as radius = 9.6 square feet

Weight of grass\* cut from 9.6 sq. ft. in grams, multiplied by 10 =  
Weight of grass in pounds per acre.

A circle with 5.64 feet as radius = 100 square feet

Weight of grass\* cut from 100 sq. ft. in pounds, multiplied by 435.6 =  
Weight of grass in pounds per acre.

\*Grass cut when full grown, carryover left on the ground or allowance made for it, and only dry weight taken or allowance made for moisture.



## CONVERSION OF STOCKING RATE

(or Carrying Capacity)

### I. A.U.M.'s to Acres per head per year

(a) Convert A.U.M.'s to A.U.'s per year by dividing A.U.M.'s by 12,

$$\text{i.e. } \frac{\text{A.U.M.'s}}{12} = \text{A.U.'s per year.}$$

(b) Divide the area (in acres) by A.U.'s per year,

$$\text{i.e. } \frac{\text{Area}}{\text{A.U.'s per year}} = \underline{\text{Acres per head per year.}}$$

#### Example

1440 A.U.M.'s for the lease of 7200 acres

$$1. \quad \frac{1440}{12} = 120 \text{ A.U. per year for the lease}$$

$$2. \quad \frac{7200}{120} = \underline{60 \text{ acres per head per year.}}$$

### II. Acres per head per year to A.U.M.'s

(a) Divide the area (in acres) by acres per head per year to get A.U.'s per year,

$$\text{i.e. } \frac{\text{Area}}{\text{Acres per head per year}} = \text{A.U.'s per year.}$$

(b) Multiply A.U.'s per year by 12 to get A.U.M.'s for that area,

$$\text{i.e. } \text{A.U.'s per year} \times 12 = \underline{\text{A.U.M.'s for that area.}}$$

#### Example

60 acres per head per year for the lease 7200 acres

$$1. \quad \frac{7200}{60} = 120 \text{ A.U.'s per year for the lease}$$

$$2. \quad 120 \times 12 = \underline{1440 \text{ A.U.M.'s for that area.}}$$



A SHORT LIST OF PUBLICATIONS ON RANGE MANAGEMENT

1. 'Range Management' By Stoddart & Smith  
McGraw Hill Book Co. Inc., New York, U.S.A. \$8.00
2. '99 Range Forage Plants of the Canadian Prairies'  
Canada Dept. of Agric. Pub. No. 964 Free
3. 'Important Utah Range Grasses'  
Extension Circ. No. 281, Ext. Dept. Utah State University,  
Logan, Utah, U.S.A. Free
4. 'Wild Plants of the Canadian Prairies'  
Expl. Farm Service,  
Canada Dept. of Agric. \$3.00
5. 'Glossary of Terms Used in Range Management'  
American Soc. of Rge. Management, Box 5041  
Portland, Oregon, 97213, U.S.A. \$0.50
6. 'Weeds of Canada' Canada Dept. of Agric. \$1.30
7. 'Weeds Poisonous to Livestock' Pub. No. 38,  
Alberta Dept. of Agric. Free
8. 'Stock Poisoning Plants of the British Columbia Ranges'  
Pub. No. 1037, Canada Dept. of Agric. Free
9. 'Hay and Pasture Crops' Pub. No. 63  
Alberta Dept. of Agric. Free
10. 'Irrigated Pastures in Southern Alberta' Pub. No. 1160  
Canada Dept. of Agric. Free
11. 'Guide to Fertilizer Use in Southern Alberta; and in  
Central and Northern Alberta'  
Pubs. No. 541-1 & 541-2,  
Alberta Dept. of Agric. Free
12. 'Reseeding Grassland Ranges in the Interior of  
British Columbia' Pub. No. 1108  
Can. Dept. of Agric. Free
13. 'Brush Control in Western Canada' Pub. No. 1240  
Can. Dept. of Agric. Free
14. 'Seeding Forest Ranges in the Dry Belt of British Columbia'  
Pub. No. 1147  
Can. Dept. of Agric. Free
15. 'Alberta Farm Guide' Alberta Dept. of Agric. Free
16. 'Range Management of Grasslands and Adjacent Farmlands  
in the Prairie Provinces'  
Alberta Dept. of Agric. Free

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